

CONTRIBUTIONS TO THE KNOWLEDGE OF SPONTANEOUS FLORA FROM THE PARK OF THE PELEȘ DOMAIN

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Abstract

Built by a series of extensive works that involved changes in topography, hydrography and vegetation of the Peleş Valley, the park of the Peleş Domain includes grassland areas whose vegetation coverage was achieved with the help of grass furrows brought from the pastures and meadows located in the surrounding area. Under the influence of local conditions, the original flora was replaced by phytocoenoses made of various species existing in the Bucegi Mountains, from the lower mountain region to the sub-alpine floor. This study presents the results of observations made on the herbaceous flora installed into the meadow in front of Peleş Castle.

Key words: herbaceous flora, meadow, mountain regions, Peleş Domain, phytocoenosis.

INTRODUCTION

The park of the Peleş Domain is composed of a succession of landscaped grounds designed according to the principles of landscape architecture where the meadow occupies a special place.

The establishment of this park, which began in the ending of the Peleş Castle building, has sought to integrate the highly modified site, covered with debris, gravels, crushed bricks or woodcuts, all remains of the construction just finished (Haret, 1924), into the natural landscape, characteristic of the area.

In this situation there was also the meadow in front of the terraces on which the castle is located, result of topographical, hydrographical and vegetal transformations of the landscapes which, although concealed in the current landscape, which they have aesthetically enhanced can be deciphered especially at the level of documentary sources and also verified on the ground (Huzui-Stoiculescu, 2015).

These transformations implied the filling of the gaps with soil brought from the top of Molomăț mountain, the drainage of the springs and the spillage of the collected water in a ramification of the Peleş stream, the correction of the 30 degrees inclination of the slope and the covering of the terrain with grass furrows

brought from the mountain meadows (Haret, 1924).

This solution for the setting up of the vegetal cover was imposed by the climate characterized by frequent and rapid rains that would have made useless sowing directly on the stuffing (Haret, 1924).

Also, for vegetation fixation, trees of different essences have been planted, few of which, of considerable size, are still found today, holding a decisive role in shaping the phytocoenoses formed on the meadows.

At this time, no further interventions have been identified to complete the vegetal cover with new herbaceous species after the initial moment of the meadow setting up. Local conditions - the 970 m altitude and the south orientation of the slope, have favored changes in the herbaceous carpet composition resulting in the disappearance of alpine flora and its replacement with subalpine grasses (Haret, 1924).

In this study we aim to show the composition of the phytocoenoses which form the meadow located in front of the Peleş Castle and to highlight the influence of the natural conditions in structuring the vegetation on an antropic initial site.

MATERIALS AND METHODS

Studies of the flora from the meadow located in front of Peleş Castle were made in May 2018.

The Peleş Castle is situated in Peleş Valley, at 970 m altitude, 25°34 '40' 'E and 45°21' 30 " N, surrounded by beech and spruce forests (*Fagus sylvatica* and *Picea abies*).

The meadow with a south exposition is crossed from north-west to south-east, on about half of its surface, by a ramification of the Peleş stream (Figure 1).

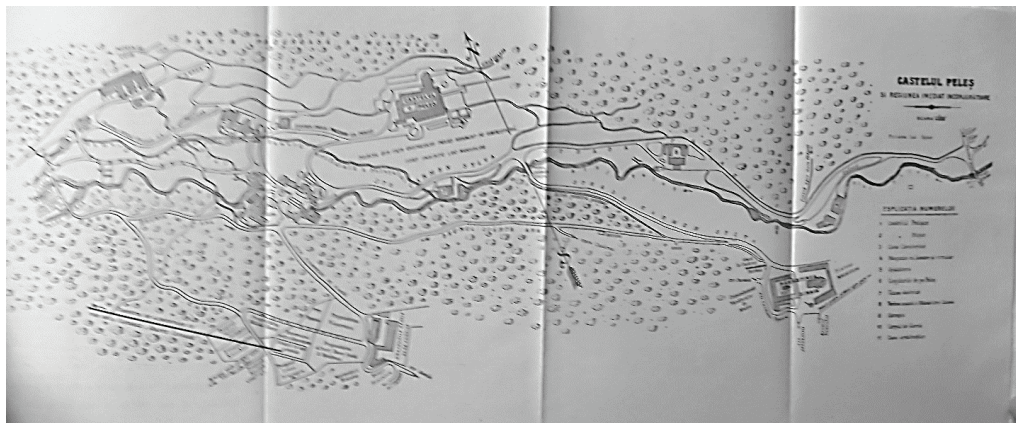


Figure 1. The map of the Peleş Domain (Haret, 1924)

Several springs marked by a characteristic vegetation can be traced from the middle of the slope to the base.

A hedge around 1 m high restricts public access. Till now, maintenance interventions consist of the hay annual harvesting.

Species of resinous or deciduous ornamental trees and shrubs are mainly found at the top or the bottom of the slope or along the ramification of the Peleş stream.

The meadow flora has been observed by crossing the land through certain segments selected according to some ecological factors such as soil moisture, using maps on which trees and shrubs were marked.

In order to achieve the phytocoenosis structure, plants species were identified with field guides (Beldie, 1967; Ciocârlan, 2009; Sârbu et al., 2013) and listed in phytosociological tables.

RESULTS AND DISCUSSIONS

In the investigate territories there were 85 herbaceous species from 23 families (Table 1). Most species - 12, belong to the *Asteraceae* family, followed by *Poaceae* - 10 species and *Fabaceae* - 9 species. *Lamiaceae* and *Rosaceae* families are present with 5 species, *Boraginaceae*, *Brassicaceae*, *Juncaceae* together with *Cyperaceae*, with 4 species each, while *Liliaceae*, *Scrophulariaceae*, *Rubiaceae*,

Apiaceae, *Polygonaceae* and *Ranunculaceae* are represented by 3 species each. From *Plantaginaceae*, *Primulaceae*, *Geraniaceae* and *Caryophyllaceae*, 2 species were recorded and one species were found from *Orchidaceae*, *Campanulaceae*, *Solanaceae*, *Euphorbiaceae*, *Urticaceae* and *Equisetaceae* families.

Species from *Poaceae* (Table 1), with the exception of the *Glyceria nemoralis* - specific for wetlands, form a mixture characteristic of *Agrostis capillaris* grasslands (Motcă, 1994), which are usually found in hilly areas up to 800 m altitude. In Bucegi, *A. capillaris* belongs to the sub-association *Festucetum rubrae agrostidetosum*, ass. *Festucetum rubrae fallax* (Puşcaru et al., 1956) - nowadays called *Scorzonero roseae - Festucetum nigricantis* (Sanda et al., 2008), which cover alluvial, relatively acidic soils, mostly located on the valleys.

Nearly stream ramifications there are phytocoenosis of *Petasites kablikianus*, and *Chaerophyllum hirsutum*, *Petasites hybridus*, *Aegopodium podagraria* may be identified as accompanying species (Table 1). On the edge of the observed area, around *Fagus sylvatica* 'Atropurpurea' exemplars or near the forest, species from the *Symphyto cordati-Fagetum* association such as *Pulmonaria rubra*, *Poa nemoralis* or *Geranium robertianum* can be identified (Table 1).

Table 1. Plant species from the Park of the Peleş Castle Domain

Families	Species	Bioforms	Geoelements	Ecological factors			Frequency (Bucegi mountains)	Utmostalt. (m)	Frequency (Romania)
				U	T	R			
Poaceae (Gramineae)	1. <i>Arrhenatherum elatius</i>	H	Euras	5	X	6	sporadically	1650	frequent
	2. <i>Festuca rubra</i>	H	Circ.	4	4	5	common	1900	frequent
	3. <i>Agrostis capillaris</i>	H	Circ.	X	X	5	common	1920	frequent
	4. <i>Trisetum flavescens</i>	H	Euras	X	X	X	frequent	1600	frequent
	5. <i>Dactylis glomerata</i>	H	Euras	4	X	X	frequent	1900	frequent
	6. <i>Poa pratensis</i>	H	Cosm.	5	X	X	frequent	1800	frequent
	7. <i>Holcus lanatus</i>	H	Cosm.	5	5	4	sporadically	1650	frequent
	8. <i>Elymus caninus</i> subsp. <i>Biflorus</i>	H	Circ.	6	X	X	sporadically	1750	sporadically
	9. <i>Briza media</i>	H	Euras.	X	4	7	-	600-700	frequent
	10. <i>Glyceria nemoralis</i>	H	Centr. Eur.	9	6	7	sporadically	1500	sporadically
Juncaceae, Cyperaceae	1. <i>Juncus effusus</i>	H	Cosm.	7	X	X	common	600-700	common
	2. <i>Carex humilis</i>	H	Circ.	3	X	7	sporadically	1750	sporadically
	3. <i>Carex sylvatica</i>	H	Circ.	5	5	6	frequent	600-700	frequent
	4. <i>Carex hirta</i>	G	Circ.	6	X	X	sporadically	950	ordinary
Fabaceae (Leguminosae)	1. <i>Trifolium pratense</i>	H	Euras.	X	X	X	frequent	2120	frequent
	2. <i>Medicago lupulina</i>	T-H	Euras	4	X	X	common	600-700	frequent
	3. <i>M. sativa</i>	H	Eur.de est, Asia centr.	4	6	7	sporadically	600-700	naturalised
	4. <i>Lotus corniculatus</i>	H	Euras.	4	X	X	frequent	2 200	frequent
	5. <i>Coronilla varia</i>	H	Centr.eur. - submedit.	4	X	X	sporadically	1680	frequent
	6. <i>Onobrychis viciifolia</i>	H	Euras.	3	X	X	sporadically	600-700	frequent
	7. <i>Vicia cracca</i>	H	Euras.	4	X	X	sporadically	1600	frequent
	8. <i>V. sepium</i>	H	Euras.	5	X	7	sporadically	600-700	frequent
	9. <i>Lathyrus pratensis</i>	H	Euras.	6	5	6	frequent	1600	frequent
Equisetaceae	1. <i>Equisetum arvense</i>	G	Cosm.	6	6	X	common	-	frequent
Ranunculaceae	1. <i>Helleborus purpurascens</i>	H	Carp.-balc.-pan.	5	5	6	frequent	-	frequent
	2. <i>Caltha palustris</i>	H	Circ.	10	X	X	frequent	-	frequent
	3. <i>Ranunculus acris</i>	H	Euras.	6	X	X	frequent	1880	frequent
Urticaceae	1. <i>Urtica dioica</i>	H	Cosm.	6	X	X	common	2170	frequent
Caryophyllaceae	1. <i>Cerastium fontanum</i>	Ch-H	Euras.	5	X	X	frequent	600-700	frequent
	2. <i>Lychnisflor-cuculi</i>	H	Euras.	6	5	X	sporadically	600-700	common
Polygonaceae	1. <i>Polygonum bistorta</i>	G	Euras.	7	4	5	frequent	-	frequent
	2. <i>Rumex acetosa</i>	H	Cosm.	X	X	X	frequent	600-700	frequent
	3. <i>R. alpinus</i>	H	Alp.eur.	6	3	5	frequent	-	frequent
Rosaceae	1. <i>Fragaria vesca</i>	H	Euras.	5	X	X	common	600-700	frequent
	2. <i>Geum rivale</i>	H	Circ.bor.	8	X	X	frequent	-	frequent
	3. <i>G. urbanum</i>	H	Circ.	5	X	X	sporadically	600-700	frequent
	4. <i>Filipendula ulmaria</i>	H	Euras.	8	X	X	sporadically	600-700	frequent
	5. <i>Alchemilla mollis</i>	H	Carp.-balc.-cauc.-anat.	6	4	4	frequent	600-700	sporadically
Geraniaceae	1. <i>Geranium phaeum</i>	H	Centr. Eur.	5	X	6	frequent	600-700	frequent
	2. <i>G. robertianum</i>	T-Ht	Euras.	X	X	X	common	-	frequent
Euphorbiaceae	1. <i>Mercurialis perennis</i>	G (H)	Eur.	X	X	X	frequent	2000	frequent
Apiaceae (Umbelliferae)	1. <i>Chaerophyllum hirsutum</i>	H	Eur.cent.	8	4	5	frequent	1750	frequent
	2. <i>Anthriscus nitida</i>	Ht	Alp.-carp.-balc.	6	4	6	frequent	1780	frequent
	3. <i>Aegopodium podagraria</i>	H (G)	Euras.	6	X	X	frequent	1870	frequent
Brassicaceae (Cruciferae)	1. <i>Alliaria petiolata</i>	Ht-H	Euras.	5	6	7	sporadically	600-700	common
	2. <i>Isatis tinctoria</i>	Ht-H	Euras.cont.	3	X	8	sporadically	-	sporadically
	3. <i>Cardamine amara</i>	H	Euras.	9	5	6	sporadically	600-700	frequent
	4. <i>Cardamine bulbifera</i>	G	Cent.eur.	5	X	X	frequent	600-700	frequent
Primulaceae	1. <i>Primula elatior</i>	H	Eur.	6	4	5	frequent	2100	frequent
	2. <i>Lysimachia nummularia</i>	Ch	Am.de N.	6	6	X	frequent	600-700	frequent
Rubiaceae	1. <i>Galium mollugo</i>	H	Euras.	5	X	X	frequent	600-700	frequent
	2. <i>Galium verum</i>	H	Euras.	4	5	7	-	600-700	frequent

	<i>3. Cruciatu glabra</i>	H	Euras.	5	6	6	common	2350	frequent
Boraginaceae	<i>1. Myosotis scorpioides</i>	H	Euras.	8	X	X	frequent	1100	frequent
	<i>2. M. sylvatica</i>	H	Eur.	6	4	4	frequent	-	frequent
	<i>3. Symphytum cordatum</i>	H	End.carp.	5	4	5	frequent	-	frequent
	<i>4. Pulmonaria rubra</i>	H	Carp.-balc.	6	4	5	frequent	2000	frequent
Lamiaceae	<i>1. Ajuga reptans</i>	H	Eur.	6	X	X	common	-	frequent
	<i>2. Lamium maculatum</i>	H (Ch)	Euras.	6	X	X	-	-	frequent
	<i>3. Salvia nemorosa</i>	H	Pont.-medit.-centr.eur.	4	X	X	-	1120	frequent
	<i>4. Thymus pulegioides</i>	Ch	Eur.	4	X	X	frequent	600-700	frequent
	<i>5. Mentha longifolia</i>	H	Euras.	8	X	X	frequent	600-700	frequent
Solanaceae	<i>1. Solanum dulcamara</i>	Ch	Euras.	9	X	X	frequent	600-700	frequent
Scrophulariaceae	<i>1. Scrophularia nodosa</i>	H	Euras.	6	6	6	frequent	600-700	frequent
	<i>2. Veronica beccabunga</i>	H	Euras.	10	X	X	frequent	-	frequent
	<i>3. V. teucrium</i>	H	Cont.euras.	3	6	X	frequent	600-700	frequent
Plantaginaceae	<i>1. Plantago lanceolata</i>	H	Euras.	X	X	X	sporadically	600-700	common
	<i>2. P. media</i>	H	Euras.	4	X	X	-	-	frequent
Campanulaceae	<i>1. Campanula abietina</i>	H	Carp.-balc.	6	4	4	frequent	2300	frequent
Asteraceae	<i>1. Bellis perennis</i>	H	Eur.	X	X	X	frequent	1950	common
	<i>2. Telekia speciosa</i>	H	Carp.-balc.-cauc.-anat.	7	5	6	frequent	-	frequent
	<i>3. Achillea millefolium</i>	H	Euras.	4	X	X	frequent	1600	frequent
	<i>4. Leucanthemum vulgare</i>	H	Euras.	4	X	X	frequent	2100	frequent
	<i>5. Tussilago farfara</i>	G	Euras.	6	X	X	common	1470	common
	<i>6. Petasites hybridus</i>	G	Carp.-sudet.-balc.	8	5	6	frequent	-	frequent
	<i>7. P. kablikianus</i>	G	Euras.	7	5	X	ordinary	1600	common
	<i>8. Cirsium oleraceum</i>	H	Euras.	7	5	6	sporadically	600-700	frequent
	<i>9. Cirsium arvense</i>	G	Euras.	X	X	X	-	600-700	common
	<i>10. Centaurea phrygia subsp. pseudophrygia</i>	H	Eur.cent.	5	4	5	frequent	600-700	frequent
	<i>11. Taraxacum officinale</i>	H	Euras.	5	X	X	common	2075	frequent
	<i>12. Crepis biennis</i>	Ht	Eur.	5	5	6	frequent	1520	common
Liliaceae	<i>1. Colchicum autumnale</i>	G	Centr. eur.	6	5	5	frequent	600-700	frequent
	<i>2. Veratrum album</i>	H	Euras.	6	4	3	frequent	600-700	frequent
	<i>3. Polygonatum verticillatum</i>	G	Euras.	5	4	4	frequent	1950	frequent
Orchidaceae	<i>1. Listeria ovata</i>	G	Euras.	6	5	6	rare	1000	frequent

Bioforms: H – Hemichrytophyta; G – Geophyta; T – Therophyta; Ht – Hemitherophyta; Ch – Chamaephyta.

Geoelements: Euras. – Eurasian; Eur. – European; Cosm. – Cosmopolite; Carp.balc.pan. – Carpatho-balciano-pannonic; E Eur., Centr. As – Est European, Central Asia; Alp. Eur. – Alpin European; Pont.medit. – centr.eur – ponto-mediterranean – central European; Circ. – cicumpolar; Centr. Eur. – Central European; Euras. Cont. – Continental Eurasian; Carp. balc.Cauc.anat. – Carpatho – balcanic – Caucaso – anatolic; Centr. Eur. Submedit. – Central European Submediterranean; Circ. bor. – Circumpolar boreal.

U – soil humidity: x – euryhydre; 3 – xero-mesophile; 4 – meso-xerophile; 5 – mesophile; 6 – meso-mesohygrophilic; 7 – mesohygrophilic; 8 – hygromesophile; 9,10 – hygrophile.

T – air temperature: x – eurythermophilic; 3 – psihrothermophilic; 4 – microphilic; 5 – mesophilic; 6 – subthermophilic.

R – soil pH: x – euryionic; 3 – acidic soils; 4 – moderate acidic soils; 5 – moderate-weakly acidic soils; 6 – weakly acidic soils; 7 – neutral soils; 8 – calcarous soils

Most species - 75% are hemicriptophyte plants (Table 1, Figure 2) which emphasizes the character of the area as a meadow (Cristea et al., 2004).

Also in the group of perennial are included species of Geophyta - 14% and Chaemphyta -

3% (Table 1). Only 3 species out of a total of 85 are annual or annual hibernate plants (Table 1) (*Geranium robertianum*, *Anthriscus nitida*, *Crepis biennis*) which indicates a relatively high stability of phytocoenosis.

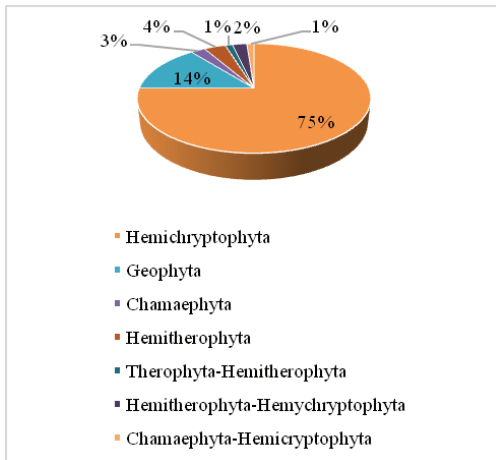


Figure 2. The bioforms spectrum

There is a reduced intervention of the anthropo-zoogenic factor, only two nitrophil species, *Urtica dioica* and *Rumex alpinus* were noted. Erosion areas are marked by the presence of *Tussilago farfara*.

From *Orchidaceae* family was found a couple of plants of *Listeria ovata* species on wet soils around the Peles brook ramification (Table 1, Figure 3).



Figure 3. *Listeria ovata*

51% of the total numbers of species (Table 1, Figure 4) are of Eurasian origin that is consistent the geoelements spectrum in our country.

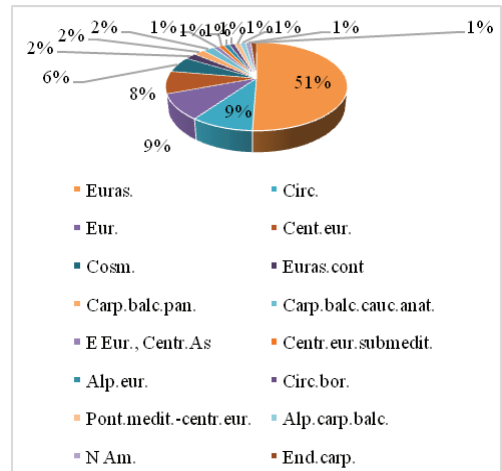


Figure 4. The Geoelements spectrum

Boreal circumpolar and circumpolar elements, representing 9% and 1% of all species, are mostly found around the watercourse, in damp and dark locations.

European, Central European and cosmopolitan elements are present in a proportion of 6%-9% (Figure 4).

Symphytum cordatum, a Carpathian endemism commonly found in the Bucegi Mountains in the median altitude mountainous areas, has been identified in areas at the base of the slope near the specimens of *Fagus sylvatica* 'Atropurpurea'.

In the field the distribution of species can be correlated with their preferred soil humidity (Figure 5).



Figure 5. The distribution in the field of species according to soil humidity

Out of the total number of the species are plants demanding high level of soil humidity, 5% are xero-mesophilic, 15% mezoxerophile, 24%

mezophile; the remainder 44% are plants growing in marshlands and wet areas (Figure 6).

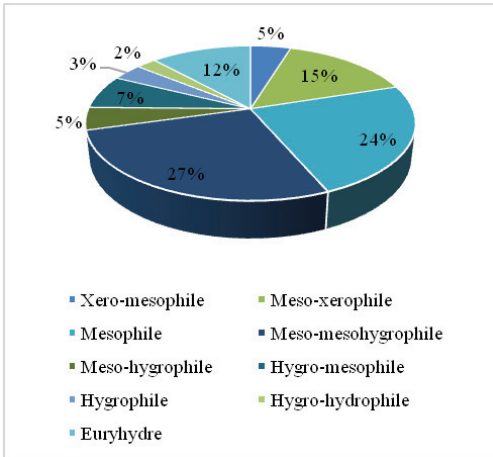


Figure 6. The soil humidity (U ecological factor) spectrum

58% of species manifest acceptance for a wide array of air temperature conditions (Figure 7) while 55% manifest it for soil pH conditions.

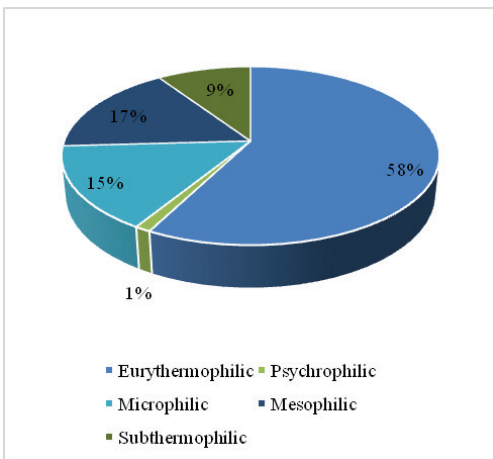


Figure 7. The air temperature (T ecological factor) spectrum

The species' overall indifference regarding surroundings factors allowed them to proliferated in all-over large areas containing multiple different micro-environments. Many of them are common species in the Bucegi Mountains and in our country (Table 1).

Although some species can be found at altitudes over 1900 m (Table 1), most of them are specific to median and lower mountainous altitudes.

CONCLUSIONS

In Peleş Castle meadow it were identified species pertained to the following associations: *Petatisetum kablíkiani*, *Scorzonero roseae - Festucetum nigricantis* and *Symphyto cordati-Fagietum*.

The majority of species presents requirements of high soil humidity while maintaining acceptance for a wide variety of air temperature and soil pH conditions.

The phytocoenoses encompass species often encountered in the median and lower altitude of the Bucegi Mountains.

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